

**WHAT IS CLAIMED IS:**

1           1.       A digital integrated circuit BTSC signal encoder for encoding audio  
2 signals, comprising:

3           (A)     a higher order IIR digital filter implemented using an allpass  
4 decomposition architecture;

5           (B)     matrix means for receiving a digital left channel audio signal and a digital  
6 right channel audio signal, comprising means for summing said digital left and right  
7 channel audio signals and thereby generating a digital sum signal, and including means  
8 for subtracting one of said digital left and right channel audio signals from the other of  
9 said digital left and right channel audio signals and thereby generating a digital difference  
10 signal;

11          (C)     sum channel processing means for processing said digital sum signal; and

12          (D)     difference channel processing means for digitally processing said digital  
13 difference signal;

14          wherein the input low pass IIR digital filter, matrix means, sum channel  
15 processing means and the difference channel processing means operate at a first sample  
16 rate to substantially match BTSC analog filter transform functions in both magnitude and  
17 phase.

1           2.       The BTSC signal encoder of claim 1, wherein the higher order IIR digital  
2 filter comprises a Cauer low pass filter.

1           3.       The BTSC signal encoder of claim 1, wherein the higher order IIR digital  
2 filter comprises an input low pass filter.

1           4.       The BTSC signal encoder of claim 1, wherein the higher order IIR digital  
2 filter comprises an output low pass filter.

1           5.       The BTSC signal encoder of claim 1, wherein the higher order IIR digital  
2 filter comprises a cascade of lower order allpass filters.

1           6.       The BTSC signal encoder of claim 5, wherein the cascade of lower order  
2 allpass filters comprises a first or second order allpass filter.

1           7.       The BTSC signal encoder of claim 1, wherein the higher order IIR digital  
2 filter comprises a Butterworth low pass filter.

1           8.       The BTSC signal encoder of claim 1, wherein the higher order IIR digital  
2 filter comprises a pre-emphasis filter in the BTSC encoder.

1           9.       The BTSC signal encoder of claim 1, wherein the higher order IIR digital  
2 filter comprises a bandpass filter in the BTSC encoder.

1           10.      The BTSC signal encoder of claim 1, wherein the higher order IIR digital  
2 filter comprises a variable emphasis compander filter in the BTSC encoder.

1           11.      An integrated circuit digital BTSC encoder that is operable to encode first  
2 and second digital audio signals into a BTSC encoded signal comprising (a) a sum  
3 channel processor comprising a first digital filter for digitally processing a digital sum  
4 signal and (b) a difference channel processor comprising a second digital filter for  
5 digitally processing a digital difference signal, comprising:  
6           a higher order digital filter constructed of a cascade of lower order allpass filters  
7 for filtering a digital audio signal as part of the BTSC encoding process;  
8           wherein the digital BTSC encoder operates at a sample rate of at least  
9 approximately 150-200 kHz so that said digital filters in the sum channel processor and  
10 the difference channel processor substantially match BTSC analog filter transform  
11 functions in both magnitude and phase.

1           12.      The integrated circuit digital BTSC encoder of claim 11, wherein the  
2 higher order digital filter comprises a Causer low pass filter.

1           13.     The integrated circuit digital BTSC encoder of claim 11, wherein the  
2     higher order digital filter comprises a Cauer low pass IIR filter.

1           14.     The integrated circuit digital BTSC encoder of claim 11, wherein the  
2     higher order digital filter comprises an eleventh order Cauer low pass IIR filter.

1           15.     The integrated circuit digital BTSC encoder of claim 14, wherein the  
2     cascade of lower order allpass filters comprises a first order allpass filter and a plurality  
3     of second order allpass filters.

1           16.     The integrated circuit digital BTSC encoder of claim 11, wherein the  
2     higher order digital filter comprises a Butterworth low pass filter.

1           17.     The integrated circuit digital BTSC encoder of claim 11, wherein the sum  
2     channel processor, difference channel processor and higher order digital filter are  
3     fabricated on a single silicon substrate using CMOS processing.

1           18.     The integrated circuit digital BTSC encoder of claim 11, wherein the  
2     higher order digital filter comprises a pre-emphasis filter in the BTSC encoder.

1           19.     The integrated circuit digital BTSC encoder of claim 11, wherein the  
2     higher order digital filter comprises a bandpass filter in the BTSC encoder.

1           20.     A single chip set top box integrated circuit digital BTSC encoder that is  
2     operable to encode first and second digital audio signals into a BTSC encoded signal,  
3     comprising a higher order IIR filter implemented using a plurality of lower order allpass  
4     IIR filters, each lower order allpass IIR filter having no limit cycle oscillations and a flat  
5     response.

1           21.     The digital BTSC encoder of claims 20, where in the lower order allpass  
2     IIR filters comprise a first or second order allpass filter.